The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 39

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GUY BLALOCK
and DAVID S. BECKER

Appeal No. 1999-2347
Application 08/892,560[1]

ON BRIEF

Before SCHAFER, BARRETT, and BLANKENSHIP, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 21-24 and 26-29.

[1] Application for patent filed July 14, 1997, entitled "Method of Preventing Aluminum Sputtering During Oxide Via Etching," which is a continuation of Application 08/657,056, filed May 24, 1996, now abandoned, which is a continuation of Application 08/375,218, filed January 19, 1995, now abandoned.

We affirm.

BACKGROUND

The disclosed invention relates to a method for creating contact vias through an oxide layer to the surface of a buried metal layer without forming non-conductive back-sputtered metal compounds on the via sidewalls.

Claim 21, the sole independent claim, is reproduced below.

> 21. A method of forming a semiconductor device, comprising:
>
> providing a substrate having a metal pad;
>
> forming a silicon nitride layer over said metal pad;
>
> forming a silicon dioxide layer over said silicon nitride layer;
>
> first dry anisotropic etching said silicon dioxide layer to form a via extending through said silicon dioxide layer to expose a portion of said silicon nitride layer; and
>
> etching said silicon nitride layer to form a via extending through the silicon nitride layer to expose a portion of said metal pad without forming non-conductive back-sputtered compounds on sidewalls of said via.

THE PRIOR ART

The Examiner relies on the following prior art:

Stocker	4,484,979	November 27, 1984
Balda et al. (Balda)	4,523,372	June 18, 1985
Erie et al. (Erie)	4,717,449	January 5, 1988
Kim et al. (Kim)	4,767,724	August 30, 1988
Barber et al. (Barber)	4,966,870	October 30, 1990
Butler	5,104,822	April 14, 1992
Keller et al. (Keller)	5,338,395	August 16, 1994
Woo et al. (Woo)	5,451,543	September 19, 1995 (filed April 25, 1994)

Wolf, Silicon Processing for the VLSI Era – Volume 2: Process Integration (Lattice Press 1990), pp. 190-194.

The main references to Barber, Erie, and Kim are summarized below.

Barber discloses a process for making borderless contacts through an insulating region. A silicon nitride layer 18 is deposited over diffusion region 12, field oxide region 14, and polysilicon interconnect line 16, where 12 and 16 are conductive regions. A layer 20 of borophosphosilicate glass (BPSG) is deposited over the layer 18. Contact windows (vias) are etched in three steps (col. 3, lines 15-25): (1) removing moisture from a reactive ion etch chamber; (2) etching the BPSG 20 until the silicon nitride layer 19 is exposed; and (3) removing the remainder of the silicon nitride layer 18 exposing the conductive regions. The purpose of the etch stop layer is to prevent consumption of the field oxide and to prevent removal of the conduction regions. Barber does not mention the problem of non-conductive back-sputtered compounds.

Erie discloses a process for making oversized vias in multilayer metallization structures (e.g., col. 1, lines 11-15; col. 2, lines 41-43). A thin film dielectric barrier material 18 of titanium oxide (Ti_xO_y) or some other material (col. 4, lines 5-7) is deposited over metallization interconnects 13, and a dielectric layer 19 of silicon dioxide is deposited over

layer 18. A via 22 is plasma etched through layer 19 down to the barrier material 18 and then the via is completed by etching the dielectric barrier material 18 in a second etch step. Erie discloses that the barrier layer 18 must be kept thin to allow it to be removed rapidly before the metallization interconnect is etched to avoid sputtering (col. 2, line 65 to col. 3, line 8). Thus, Erie expressly discloses etching to avoid the problem of sputtering of the metal layer.

Kim discloses a process for making unframed or borderless contacts. Interconnects 24, which may be metal (col. 3, lines 42-44) or doped polysilicon (col. 3, lines 54-58), are covered with a thin aluminum oxide etch stop layer 28, which is covered with a dielectric layer 30'. The layer 30' is etched by reactive ion etching down to aluminum oxide layer 28' and the aluminum oxide layer 28' is removed by another etch process (col. 4, lines 13-32, 50-54). The aluminum oxide 28' acts as an effective etch stop and prevents attack on the patterned conductive layer 24 (col. 4, lines 36-39). However, Kim does not explicitly describe that an attack on the patterned conductive layer would cause non-conductive back-sputtered compounds to form on the sidewalls of the via.

The materials for the three layers and the two etch steps are summarized below:

Claim 21

conductive layer:	metal
etch stop layer:	silicon nitride
dielectric layer:	silicon dioxide
first etch step:	dry anisotropic
second etch step:	any that not produce back-sputtering

Barber

conductive layer:	polysilicon
etch stop layer:	silicon nitride
dielectric layer:	BPSG
first etch step:	BCl_3
second etch step:	CHF_3 and O_2 gases

Erie

conductive layer:	metal, e.g., aluminum/copper
etch stop layer:	titanium oxide or other (unspecified) material
dielectric layer:	silicon dioxide
first etch step:	plasma etch with first etch gas
second etch step:	plasma etch with second etch gas

Kim

conductive layer:	metal or doped polysilicon
etch stop layer:	aluminum or magnesium oxide
dielectric layer:	silicon oxide
first etch step:	reactive ion etching
second etch step:	BCl_3 and O_2 gases

THE REJECTIONS

Claim 27 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention.

Claims 21, 23, 24, 26, 28, and 29 stand rejected under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being unpatentable over Woo.

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woo, as applied to claim 21, further in view of Butler or Keller.

Claim 27 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Woo, as applied to claim 21, further in view of Stocker.

Claims 21, 23, 24, 26, and 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber and either Erie or Kim and optionally with Woo.

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber and either Erie or Kim and optionally with Woo, as applied to claim 21, further in view of Butler or Keller.

Claim 23 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber and either Erie or Kim and optionally with Woo, as applied to claim 21, further in view of Wolf.

Claim 27 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber and either Erie or Kim and optionally with Woo, as applied to claim 21, further in view of Stocker.

Claims 28 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber and either Erie or Kim and

optionally with Woo, as applied to claim 21, further in view of Balda or Woo.

We refer to the final rejection (Paper No. 30) (pages referred to as "FR__") and the examiner's answer (Paper No. 38) (pages referred to as "EA__") for a statement of the Examiner's position, and to the revised brief on appeal (Paper No. 37) (pages referred to as "Br__") for a statement of Appellants' arguments thereagainst.

OPINION

35 U.S.C. § 112, second paragraph

The Examiner concludes that the term "low" in the limitation "low selective etch" is indefinite and that the scope of the limitation cannot be determined (FR2; EA5).

Appellants argue that the rejection is "nonsensical" because the Examiner discusses low selectivity etching in rejecting claim 27 and when discussing Stocker (Br7).

The Examiner responds that a rejection under 35 U.S.C. § 112 does not preclude a rejection under §§ 102 or 103 (EA29).

We agree with the Examiner that inconsistent rejections are permitted. This avoids piecemeal examination, which is to Appellants' benefit. In any case, the Examiner never admitted that the meaning of "low" was known, as argued by Appellants. The Examiner clearly rejected claim 27 based on the best

understanding of the term, i.e., "insofar as what constitutes such an etching can be determined or deciphered" (FR9).

Appellants argue (Br7) that the specification discusses low selective etching on page 5, lines 19-21, stating "the via may be formed by first using a low selective (oxide to nitride) standard etch down to a point just above the nitride layer."

While this provides written description support for the limitation, it does not define what is meant by "low." We note that Appellants tried to amend the specification to define that "[a] 'low selective' etch means an etch having an oxide etch rate which is less than 10 times its nitride etch rate" (amendment filed August 9, 1995, Paper No. 5). The Examiner objected to the addition as new matter (Paper No. 6, p. 2) and the amendment was canceled.

Appellants next argue that the selectivity in etching silicon oxide and silicon nitride, as well as anisotropic etching, is well defined in U.S. Patent 5,286,344 to Blalock et al. (Blalock) which is incorporated by reference on page 8 of the specification (Br7-8).

Instead on pointing out what part of Blalock defines what is meant by "low selective etch," Appellants leave it to us to figure out. This is not the type of argument calculated to persuade us of error. Blalock is not directed to the etch steps of claim 27. Nevertheless, claim 13 of Blalock recites a "high"

level of selectivity (oxide to nitride) of 10:1, so we think one of ordinary skill in the art would have been apprised that a "low" selective etch would be less than 10:1. An exact ratio is not required. The rejection of claim 27 is reversed.

Declaration under 37 CFR § 1.131

Appellants filed a declaration of prior invention in the United States (part of Paper No. 29) under 37 CFR § 1.131 to antedate Woo. 37 CFR § 1.131(a)(1) states, in pertinent part:

> When any claim of an application ... is rejected under 35 U.S.C. § 102(a) or (e), or 35 U.S.C. § 103 based on a U.S. patent to another or others which is prior art under 35 U.S.C. § 102(a) or (e) and which substantially shows or describes but does not claim the same patentable invention, as defined in § 1.601(n) ..., the inventor of the subject matter of the rejected claim ... may submit an appropriate oath or declaration to overcome the patent or publication. [Underlining for emphasis.]

Thus, an oath or declaration under 37 CFR § 1.131 is precluded if Woo claims "the same patentable invention, as defined in [37 CFR] § 1.601(n)" as Appellants.

"The same patentable invention" refers to whether two inventions are the same invention in a patentability sense, i.e., anticipated or obvious over one another, not whether the claimed inventions are actually patentable over the prior art. The test for "the same patentable invention" under 37 CFR §§ 1.131 and 1.601(n) involves a determination of whether the invention claimed in the prior art is the same patentable invention as

Appellants' claims. 37 CFR § 1.131. An invention A is the same patentable invention as an invention B if invention A is the same as or is obvious in view of invention B assuming invention B to be prior art. 37 CFR § 1.601(n). In other words, Appellants' claimed invention must anticipate or render obvious Woo's claimed invention for there to be the same invention. (That is, the analysis is the same as an obviousness-type double patenting analysis.) In this way, the U.S. Patent and Trademark Office assures itself that it will not issue two patents to the same patentable invention. If Woo is not claiming "the same patentable invention" as Appellants, applying the § 1.601(n) analysis, Appellants are entitled to antedate the Woo patent using § 1.131.

Appellants argue that the Examiner has not indicated that any of Appellants' claims are allowable to the same patentable invention and, on this point alone, an interference proceeding is inappropriate (Br9).

Appellants are correct that an interference proceeding is inappropriate until allowable subject matter is indicated. The provision of § 1.131 which bars the use of a § 1.131 declaration contemplates that the priority determination will be conducted inter partes rather than ex parte. However, Appellants are prevented from having an interference with Woo because, as we

hold below, their claims are unpatentable on grounds which do not involve Woo.

The Examiner states that Woo claims the rejected invention and, thus, the declaration is inappropriate (EA19).

Appellants argue that Woo does not claim the same invention because the presently claimed invention only requires the first five steps of Woo's claim 1 (Br10).

Appellants erroneously interpret "the same patentable invention" as requiring identical claims, apparently in the sense of the "same invention" for same invention-type double patenting under 35 U.S.C. § 101, when the actual legal test of 37 CFR § 1.601(n) is anticipation or obviousness.

No patentability analysis is provided by the Examiner. Nevertheless, Appellants admit that Woo anticipates claim 21 because it is said that Woo claims the five steps of claim 21 in addition to other steps (Br10). Woo recites that the etch stop layer prevents resputtering of the conductor during etching of the second dielectric layer, but does not recite etching the etch stop layer without resputtering, i.e., "without forming non-conductive back-sputtered compounds on sidewalls of the via." Nevertheless, one of ordinary skill in the art would have appreciated that etching of the etch stop layer should not cause back-sputtering or the purpose of using the etch stop layer would be negated. Appellants do not argue that the silicon nitride

etch step of their claim 21 is not anticipated or rendered obvious by Woo. Thus, going one way, Appellants claim "the same patentable invention" as Woo.

In any event, the question under 37 CFR §§ 1.131 and 1.601(n) is whether Woo is anticipated or rendered obvious if Appellants' claim 21 is considered to be prior art. Neither the Examiner nor Appellants address this question.

We conclude that Woo's claim 1 would have been obvious over Appellants' claim 21 taken together with Wolf, Silicon Processing for the VLSI Era – Volume 2: Process Integration (Lattice Press 1990), pp. 280-281, 294 (copy attached). Woo's claim 1 is directed to the right-hand structure of Woo's Fig. 12. We address what we consider to be arguable differences. One difference is that Woo's claim 1 recites that the first conductor is on a "dielectric layer," whereas Appellants' claim 21 recites a "substrate." It can not be reasonably contested that it was known to make a substrate from a dielectric layer.

Another difference between Woo's claim 1 and Appellants' claim 21 is that Woo's claim 1 recites that the first conductor is "overlying and abutting a metal plug in a first dielectric layer" whereas Appellants' claim 21 does not call for a metal plug. We find that it was well known in the semiconductor art to deposit conductive lines over metal plugs to provide multilayer interconnects. Also, Wolf, Fig. 4-59(d), shows two metal

conductor layers, each over a metal plug to a lower metal conductor. We conclude that it would have been obvious to deposit the metal pad in Appellants' claim 21 over a metal plug based on general knowledge in the art and on Wolf.

Another difference is that Woo's claim 1 recites that the via created by the two etching steps is filled with a metal to form a filled opening, whereas Appellants' claim 21 does not recite a sixth step of filling the via (although it is manifestly intended to be filled with a metal plug). We find that it was well known in the semiconductor art that vias were formed to be filled with a metal plug. Also, Fig. 4-59(d) of Wolf shows the via to a first metal layer filled with a metal plug. We conclude that it would have been obvious to fill the via of Appellants' claim 21 with a metal plug based on general knowledge in the art and on Wolf.

Another difference is that Woo's claim 1 recites repeating the first five steps a second time, whereas Appellants' claim 21 does not. We find that it was well known in the semiconductor art to repeat the same process steps used to connect a conductive layer with an underlying conductive layer to provide a second (or higher level) of interconnections. Wolf shows the use of the identical structure for a two level interconnect structure. We conclude that it would have been obvious to repeat the five steps of Appellants' claim 21 a second time after filling the via with

a metal plug based on general knowledge in the art and on Wolf. Balda, of record, also shows forming multiple layers.

We conclude that Woo's claim 1 would have been obvious over Appellants' claim 21 taken together with Wolf and Balda.

Appellants argue that the present application presents genus claims with Woo being the species claims and, under Manual of Patent Examining Procedure (MPEP) § 715.03, Appellants have established possession of the generic invention prior to the effective date of the reference and are entitled to swear back of Woo (Br10). Appellants' relationship to Woo is more properly characterized as subcombination/combination rather than a chemical genus/species. Nevertheless, MPEP § 715.03 is directed to chemical genus/species relationship situations where predictability is in question, i.e., where the species may not be obvious over the genus. Cf. In re Baird, 16 F.3d 380, 382, 29 USPQ2d 1550, 1552 (Fed. Cir. 1994) (disclosure of a chemical genus does not by itself render obvious any species that happens to fall within it). Here, there are no chemical reactions and no questions of predictability. In addition, MPEP § 715.03 does not relate to the situation where an applicant is claiming the same patentable invention, as defined in 37 CFR § 1.601(n), as the prior art reference. Section 715.03 provides guidance as to sufficient showings where the rejection is not based upon a U.S. patent which claims the same invention as claimed by the

applicant. Woo's claimed inventions would have been obvious over Appellants' claim 21. Thus, Appellants' cannot rely on MPEP § 715.03 to swear back of Woo.

We conclude that Woo's claim 1 and Appellants' claim 21 are directed to the same patentable invention and, thus, Woo may not be overcome with a declaration under 37 CFR § 1.131. For this reason, we need not address the merits of the declaration. Normally, an applicant can provoke an interference with a patent if he or she is claiming the same invention and is not entitled to swear back of that patent. However, since we sustain the rejections based on other prior art, we provisionally sustain the rejections over Woo. If the rejections over the non-Woo prior art references are reversed upon judicial review, Appellants may file a statement under 37 CFR § 1.608(b) to try to provoke an interference with Woo.

35 U.S.C. § 102(e)/103(a) – Woo

Appellants rely on the declaration under 37 CFR § 1.131 to remove Woo as a prior art reference. The merits of the rejections of claims 21, 23, 24, 26, 28, and 29 under 35 U.S.C. § 102(e)/103(a) over Woo are said to be moot and are not otherwise contested (Br12). Because we conclude that Woo may not be overcome with a 37 CFR § 1.131 declaration, and because the rejections are not otherwise argued, the rejections of claims 21,

23, 24, 26, 28, and 29 under § 102(e)/103 over Woo are sustained pro forma.

As to the rejection of claim 22 over Woo, Butler, and Keller and the rejection of claim 27 over Woo and Stocker, Appellants argue that Woo has been overcome and the rejections relying on Woo are moot (Br23). No arguments on the merits of the rejections including Woo are presented. Because Woo is not overcome as a reference, and because no arguments on the merits have been presented, the rejections of claims 22 and 27 are sustained pro forma.

35 U.S.C. § 103(a)

Claims 21, 23, 24, 26, and 28 – Barber, Erie, Kim

Claim 21 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Barber and either Erie or Kim and optionally with Woo. We do not consider the combination with Woo inasmuch as we have already sustained the rejection over Woo and because we wish to keep the rejections over Woo separate.

The Examiner finds that Barber, Erie, and Kim all teach a conductive layer covered by an etch stop layer covered by a dielectric layer, where a via is created by etching the dielectric layer down to the etch stop layer and then etching the etch stop layer down to the conductive layer. The Examiner finds that Barber teaches a silicon nitride etch stop layer, but does

not teach a metal conductive layer. (We note that Barber also discloses a BPSG dielectric rather than a silicon dioxide layer as claimed, but this difference is not argued and will not be discussed.[2]) The Examiner finds that Erie and Kim teach metallization interconnects and a silicon dioxide dielectric layer, but do not teach a silicon nitride etch stop layer. The Examiner concludes that it would have been obvious to one of ordinary skill in the art either: (1) to use metallization interconnections in Barber because metallization interconnections were conventional as taught in Erie and Kim (FR5; EA7); or, alternatively, (2) to use silicon nitride as the etch stop layer in Erie or Kim because silicon nitride was a conventional etch stop material and etching can be done with a high degree of selectivity as taught in Barber (FR5; EA7).

The rejection focuses on the obviousness of providing the three layers of metal pad, silicon nitride, and silicon dioxide.

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[2] BPSG is a ternary (three component) oxide system B_2O_3-P_2O_5-SiO_2 which includes silicon dioxide. See Wolf et al., Silicon Processing for the VLSI Era – Volume 1: Process Technology (Lattice Press 1986), pp. 189-190 (copy attached). The reason the silicon dioxide layer is not argued may be because Appellants consider silicon dioxide to cover BPSG. In any case, however, arguments not raised are considered waived. Cf. In re Wiechert, 370 F.2d 927, 936, 152 USPQ 247, 254 (CCPA 1967) ("This court has uniformly followed the sound rule that an issue raised below which is not argued in this court, even if it has been properly brought here by a reason of appeal, is regarded as abandoned and will not be considered. It is our function as a court to decide disputed issues, not to create them.").

Although not expressly (or, at least, not clearly) stated in the rejection, it is apparently the Examiner's position is that with these three material layers, the negative limitation of "without forming non-conductive back-sputtered compounds on sidewalls of said via" would be inherently met because no back-sputtering is mentioned. Appellants' position is that none of the references suggest overcoming the problem of metal sputtering during oxide via etching and, so, do not suggest the negative limitation of "without forming non-conductive back-sputtered compounds on sidewalls of said via" even if combined as suggested by the Examiner.

The basic flaw in Appellants' arguments is the failure to recognize that Erie expressly discloses that the barrier layer 18 (etch stop layer) must be kept thin to allow it to be removed rapidly before the aluminum metallization interconnect is etched to avoid sputtering of aluminum oxide (col. 2, line 65 to col. 3, line 8). Thus, Erie specifically discusses etching to avoid the problem of sputtering of the metal layer.

Appellants argue (Br13-14) that the Ti_xO_y dielectric barrier in Erie is used to "permit rapid removal ... in this region without substantial effect on an underlying dielectric layer" (col. 2, lines 62-64) and "[t]hus, Erie et al. does not recognize the problem of metal sputtering during oxide via etching" (Br14). However, Appellants refer to the paragraph in Erie before the

discussion of sputtering of the metallization interconnect, which is not persuasive. The Examiner, likewise, did not appreciate the prevention of the sputtering teaching of Erie. Although we believe the reason Barber and Kim use etch stop layers is also to prevent sputtering of the underlying conductors, whether the conductors are made of metal or polysilicon, it is not necessary to rely on such a finding.

We conclude that it would have been obvious to modify Barber in view of Erie and Kim to arrive at the subject matter of claim 21. Appellants do not address why it would have been unobvious to use metal interconnections in Barber in view of the metal interconnections taught in Erie and Kim as stated by the Examiner. Instead, Appellants rely on the argument that none of Barber, Erie, or Kim teaches metal sputtering. We have shown Appellants' argument to be in error because overcoming the problem of metal sputtering is taught by Erie. It was well known in the semiconductor art to use metal interconnections, as evidenced by Erie and Kim. The fact that Barber, Erie, and Kim all teach an electrically conductive interconnect layer covered by an etch stop layer covered by a dielectric layer, where a via is created by etching the dielectric layer down to the etch stop layer and then etching the etch stop layer down to the conductive layer would have suggested (i.e., provided motivation for) the substitution of materials for the various layers. Moreover, Kim

discloses that the interconnect may be aluminum or polysilicon which indicates that the interchangeability of these materials was known to those of ordinary skill in the art. Thus, we conclude that it would have been obvious to one of ordinary skill in the art to use metal interconnections as taught by Erie and Kim in place of the polysilicon interconnections in Barber. One of ordinary skill in the art would have been motivated to etch the silicon nitride etch stop layer so as to not form non-conductive back-sputtered compounds of the metal interconnections in view of the teachings of Erie that the etch stop layer should be etched to avoid sputtering of the underlying metallization.

Alternatively, we conclude that it would have been obvious to modify Erie in view of Barber to arrive at the subject matter of claim 21. Erie teaches that other materials than titanium oxide can be used for the etch stop layer (col. 4, lines 5-7). Barber teaches silicon nitride as an etch stop layer in the same environment of making contact vias. One of ordinary skill in the art would have been motivated to substitute silicon nitride for the titanium oxide etch stop layer in Erie because silicon nitride was a known alternative etch stop material, as taught by Barber.

Appellants argue that the Examiner's assertion that it would have been obvious to use silicon nitride in place of the Ti_xO_y in

Erie ignores that Erie does not recognize the problem of metal sputtering during oxide via etching (Br13-14). However, Erie expressly recognizes the problem of aluminum sputtering and teaches the solution that the etch stop layer should be made thin and etched so as to avoid sputtering of the underlying metallization. Such teaching would apply no matter what etch stop material is used.

For the reasons discussed above, we conclude that there is sufficient evidence to establish a prima facie case of obviousness. The rejection of claims 21, 23, 24, 26, and 28 over Barber, Erie, and Kim is sustained.

Claim 22 – Barber, Erie, Kim, Butler, and Keller

Appellants argue that the teachings of Butler and/or Keller do not discuss metal sputtering and do not overcome the deficiencies of Barber, Erie, and Kim (Br17).

This argument does not address the separate patentability of claim 22, but basically argues that Butler and Keller do not overcome the deficiencies of the rejection of claim 21 and, so, the rejection of claim 22 should be reversed because it depends on claim 21. This argument is not persuasive because we have sustained the rejection of claim 21 over Barber, Erie, and Kim.

Appellants argue that the Examiner has provided no motivation supporting the combination (Br17-18).

However, Appellants fail to address or show error in the Examiner's reasons at FR6-8. Merely alleging lack of motivation without addressing the Examiner's reasons is not a persuasive argument. The Examiner's reasoning is sustained absent a showing of error.

For the reasons discussed above, the rejection of claim 22 is sustained.

Claim 23 – Barber, Erie, Kim, and Wolf

Appellants argue that Wolf does not discuss metal sputtering and does not overcome the deficiencies of Barber, Erie, and Kim (Br18).

This argument does not address the separate patentability of claim 23, but basically argues that Wolf does not overcome the deficiencies of the rejection of claim 21 and, so, the rejection of claim 23 should be reversed because it depends on claim 21. This argument is not persuasive because we have sustained the rejection of claim 21 over Barber, Erie, and Kim.

Appellants argue that the Examiner has provided no motivation supporting the combination (Br18-19).

However, Appellants fail to address or show error in the Examiner's reasons at FR8. Merely alleging lack of motivation without addressing the Examiner's reasons is not a persuasive argument. The Examiner's reasoning is sustained absent a showing

of error. In addition, we note that Erie and Kim expressly disclose aluminum metal pads as claimed.

For the reasons discussed above, the rejection of claim 23 is sustained.

Claim 27 – Barber, Erie, Kim, and Stocker

Appellants argue that Stocker does not discuss metal sputtering and does not overcome the deficiencies of Barber, Erie, and Kim (Br19-21).

This argument does not address the separate patentability of claim 27, but basically argues that Stocker does not overcome the deficiencies of the rejection of claim 21 and, so, the rejection of claim 27 should be reversed because it depends on claim 21. This argument is not persuasive because we have sustained the rejection of claim 21 over Barber, Erie, and Kim.

Appellants argue that the Examiner has provided no motivation supporting the combination (Br20-21).

However, Appellants fail to address or show error in the Examiner's reasons at FR9-10. Merely alleging lack of motivation without addressing the Examiner's reasons is not persuasive argument. The Examiner's reasoning is sustained absent a showing of error.

For the reasons discussed above, the rejection of claim 27 is sustained.

Claims 28 and 29 – Barber, Erie, Kim, and Balda

Appellants argue that Balda uses a dry etch through an organic polyimide layer down to a silicon nitride protective layer, whereas the claims recite an inorganic silicon dioxide layer over a silicon nitride layer (Br21). It is argued that high selectivity is easier to obtain between organic and inorganic materials than between two organic materials such as silicon oxide and silicon nitride and, thus, the dry etch of Balda would not work with the materials required of the present invention (Br21-22).

These arguments are not directed to the limitations of claims 28 or 29. Balda is not relied on for the teachings of the material for the layers as recited in claim 21. Erie teaches a silicon dioxide layer over an etch stop layer and also teaches avoidance of sputtering.

Appellants argue that Balda does not discuss metal sputtering and does not overcome the deficiencies of Barber, Erie, and Kim (Br22).

This argument does not address the separate patentability of claims 28 and 29, but basically argues that Balda does not overcome the deficiencies of the rejection of claim 21 and, so, the rejection of claims 28 and 29 should be reversed because they depend on claim 21. This argument is not persuasive because we

have sustained the rejection of claim 21 over Barber, Erie, and Kim.

In addition, we do not know how Appellants can argue that "Balda et al. does not teach or suggest the problem of metal sputtering" (Br22). Balda expressly discloses the problem of sputter etching and subsequent redeposition of materials on the walls of the via during the reactive ion etch processing (col. 1, line 58 to col. 2, line 49; col. 3, line 28 to col. 4, line 10 in connection with Fig. 1). Balda teaches using a thin etch stop layer of silicon nitride and a two-step etch process. Balda is not relied on for the sputtering problem; however, it would make a good addition to the rejection of claim 21 because it teaches that the aluminum sputtering problem was well known in the art in 1985, 10 years before the present invention.

Appellants argue that the Examiner has provided no motivation supporting the combination (Br22).

However, Appellants fail to address or show error in the Examiner's reasons at FR10-11. Merely alleging lack of motivation without addressing the Examiner's reasons is not a persuasive argument. The Examiner's reasoning is sustained absent a showing of error.

For the reasons discussed above, the rejection of claim 28 is sustained.

Appellants make one argument on the merits. It is argued that Balda does not teach the limitations of claim 29 (Br29), but no explanation is provided.

The limitations of claim 29 are taught by or would have been obvious over Figs. 5 and 6 of Balda. Figure 5 shows depositing a silicon nitride protection layer 50 over a metal layer 48. Figure 6 shows etching the silicon nitride layer 50 and metal layer 48 to form a silicon nitride cap on the metal pad. This structure is covered by an insulating layer (Fig. 7) and subjected to a two-step etching process (Figs. 8 & 9). While the metal layer 48 is not directly on the substrate, the limitation of claim 21 of "a substrate having a metal pad" does not require the pad to be directly on the substrate. In any case, however, Balda teaches forming the etch stop layer as a conformal layer (Figs. 2-4) or as a cap (Figs. 5-9) and it would have been obvious to use either method on a metal pad in contact with the substrate. Thus, we conclude that claim 29 would have been obvious over Barber, Erie, Kim, and Balda. The rejection of claim 29 is sustained.

CONCLUSION

The rejections of claims 21-24 and 26-29 are sustained.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

RICHARD E. SCHAFER Administrative Patent Judge	)	
LEE E. BARRETT Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
HOWARD B. BLANKENSHIP Administrative Patent Judge	)	

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